

Remarks

Claims 1-25 are pending in the present application. Claim 1-25 are rejected under 35 U.S.C. §102(b) as being anticipated by Hertl et al. (U.S. Patent No. 5,417,947). Claims 1-25 are also rejected under 35 U.S.C. §103(a) as being unpatentable over Hertl in view of Minami et al. (U.S. Patent No. 5,140,811.)

New claims 26-29 are presented for examination. These new claims recite temperatures at which greater than 90% of the low molecular weight hydrocarbons desorb from the hydrocarbon desorbing material. The antecedent basis for these new claims may be found in Figure 6 of the application which clearly shows that "greater than 90% of the low molecular weight hydrocarbons desorb at temperatures of about 400° C or greater" and that "greater than 90% of the low molecular weight hydrocarbons desorb at temperature of about 500° C or greater." Claims 26 -27 depend from claim 1 while claims 28-29 depend from claim 14. No new matter is added by these new claims.

Claims 1 and 14 are amended to include the limitation "wherein significant desorption of the low molecular weight hydrocarbons does not occur until a sufficiently high temperature is attained so that the low molecular weight hydrocarbons can be converted to innocuous species by a catalyst." The antecedent basis for this amendment is found in the specification at paragraphs 29 and 40. Claim 14 is further amended so that the word "that" is inserted after "ratio" as suggested by the Examiner. No new matter is added by this amendment.

The present invention provides a method for removing hydrocarbons from an exhaust gas of an internal combustion engine. Specifically, the present invention recognizes the importance of utilizing a hydrocarbon-removing material such as a zeolite with an appropriate Si to Al atom ratio such that desorption of less than 50% of adsorbed hydrocarbons occurs at less than 250 °C. Moreover, the Si to Al ratio is such that desorption of the low molecular weight hydrocarbons does not occur until a sufficiently high temperature is attained

so that the low molecular weight hydrocarbons can be converted to innocuous species by a catalyst. The method of the invention comprises contacting an exhaust gas with a water-removing composition and then contacting the exhaust gas at a position downstream from the water-removing composition with a hydrocarbon-removing material to remove hydrocarbons from the exhaust gas. The hydrocarbon-removing material use in the present invention has a sufficiently low Si to Al atom ratio that less than 50% of the low molecular hydrocarbons desorb from the hydrocarbon-removing composition at a temperature of 250°C.

a. Claim Objections

Claim 14 is amended so that the word “that” is inserted after “ratio” as suggested by the Examiner thereby removing the objection of this claim.

b. Rejection Under 35 U.S.C §102(b)

Claims 1-25 are rejected under 35 U.S.C §102(b) as being anticipated by Hertl et al. (U.S. Patent No. 5,417,947).

Applicants respectfully disagree with the Examiner for the reasons set forth below. Independent claims 1 and 14 have been amended to include the limitation “wherein significant desorption of the low molecular weight hydrocarbons does not occur until a sufficiently high temperature is attained so that the low molecular weight hydrocarbons can be converted to innocuous species by a catalyst.” None of the references cited by the examiner appreciate the importance of tailoring the operation of a tandem water-removing composition and hydrocarbon-removing material with properties such that significant desorption of the low molecular weight hydrocarbons does not occur at a temperature at which a catalytic converter in a vehicle exhaust may remove such hydrocarbons. Independent claims 1 and 14 express this tailoring with the limitation - “the hydrocarbon-removing material has a sufficiently low Si to Al atom ratio that is less than about 50% of the low molecular weight hydrocarbons desorb from the hydrocarbon-removing material at a temperature of about 250°C and wherein significant desorption of the low molecular weight hydrocarbons does not occur until a

sufficiently high temperature is attained so that the low molecular weight hydrocarbons can be converted to innocuous species by a catalyst.”

Hertl does not anticipate the present invention because Hertl does not disclose every element of the invention. (See for example, *Akzo N.V. v. United States Int'l Trade Comm'n*, 1 USPQ 2d 1241, 1245 (Fed. Cir. 1986), cert. denied, 482 U.S. 909 (1987).) Applicant restates his assertion in his previous response that Hertl does not teach the utilization of a hydrocarbon-removing material having “a sufficiently low Si to Al atom ratio that is less than about 50% of the low molecular weight hydrocarbons desorb from the hydrocarbon-removing material at a temperature of about 250°C” as required by independent claims 1 and 14 of the present invention. Equally significantly, Hertl does not describe a hydrocarbon removing material in which “significant desorption of the low molecular weight hydrocarbons does not occur until a sufficiently high temperature is attained so that the low molecular weight hydrocarbons can be converted to innocuous species by a catalyst.”

The Examiner's statement that Hertl discloses a hydrocarbon removing material with a Si to Al ratio which falls within the range of the present invention only considers part of the limitation of the present invention. Specifically, amended claims 1 and 14 now require that significant desorption of the low molecular weight hydrocarbons does not occur until a sufficiently high temperature is attained so that the low molecular weight hydrocarbons can be converted to innocuous species by a catalyst. Hertl does not disclose such a limitation. Moreover, it is not just the Si to Al ratio that determines the adsorption properties of the hydrocarbon removing material. The size of the pores in this material is also important for adsorption of molecules. Hertl recognizes this scientific fact but does not capitalize on it in the manner of the present invention:

Some typical hydrocarbon adsorbing agents which are especially suited to the practice of the present invention are molecular sieves, activated carbon, and combinations of these. Molecular sieves are crystalline substances having pores of size suitable for adsorbing molecules.

Hertl, col. 3, 60-65

The limitations in claims 1 and 14 when considered in their entirety are applying this behavior in a novel way to tailor the temperature behavior of the hydrocarbon removing material. Applicants respectfully submit that claims 1 and 14 are not anticipated for these reasons.

Accordingly, since Hertl does not anticipate independent claims 1 and 14, dependent claims 2-13 which depend from claim 1, and dependent claims 14-25 which depend from claim 14 are also not anticipated by Hertl.

b. Rejection Under 35 USC §103(a)

Claims 1-25 are also rejected under 35 USC §103(a) as being unpatentable over Hertl in view of Minami et al. (U.S. patent no. 5,140,811.)

Applicants respectfully disagree with the Examiner's rejection under §103(a) for the following reasons. Neither Hertl nor Minami whether considered individually or in combination disclose a tandem water-removing composition and hydrocarbon-removing material in which hydrocarbon removing material such that significant desorption of low molecular weight hydrocarbons does not occur at a temperature at which a catalytic converter in a vehicle exhaust may remove such hydrocarbons. The deficiencies in Hertl have been set forth above.

Minami discloses an exhaust gas purification device for automotive applications. Minami does not disclose the use of a water-removing composition. The device of Minami includes a hydrocarbon absorber that operates up to a first gas temperature (such as 200 °C) (Minami, Abstract). The purification device of Minami then release the absorbed hydrocarbons in the exhaust gas above a second gas temperature (such as 400 °C.) The exhaust gases bypass the hydrocarbon absorber when "the temperature detected by said temperature detection means is at or above said first temperature and not higher than a second temperature." (Minami, col. 2, ll. 60-65.) Specifically, Minami states that this bypassing of

the hydrocarbon absorber should occur and therefore the absorber operated "until the temperature of the exhaust gas rises not to be higher than 300 °C, more desirably not to be higher than 250 ° C." (Minami, col. 4, ll. 50-53.) The present invention does not require such a bypassing of the absorber. Instead, by recognizing (which Minami does not) that modern catalysts do not require such a high temperature of operation, the present invention allows for a simpler design in which bypass channels are not necessary. Because both Hertl and Minami fail to teach this important limitation, independent claims 1 and 14 of the present invention are patentable over Hertl in view of Minami.

Applicant's state that there is no motivation to combine the teachings of Minami and Hertl. Moreover, the combination of these references does not reproduce the present invention. Hertl discloses a tandem water-removing composition and hydrocarbon removing material with different adsorption properties than the present invention. The only possible combination of Hertl and Minami leads to a tandem water-removing composition and hydrocarbon removing material in which the hydrocarbon removing material is bypassed above a certain temperature. This combination is not the present invention. One skilled in the art would not be motivated to make such a combination since such a system is needlessly complicated when considering the temperature characteristics of modern catalytic converters. Moreover, the grafting of certain features of Minami onto Hertl is the purist form of hindsight.

Accordingly, since independent claims 1 and 14 are patentable over Hertl in view of Minami, dependent claims 2-13 which depend from claim 1 and dependent claims 14-25 which depend from claim 14 are also patentable.

Conclusion

Applicants have made a genuine effort to respond to each of the Examiner's rejections in advancing the prosecution of this case. Applicants believe that all formal and substantive requirements for patentability have been met and that this case is in condition for allowance, which action is respectfully requested. If a telephone or video conference would help expedite allowance or resolve any additional questions, such a conference is invited at the Examiner's convenience.

Applicants believe that no additional fees are required as a result of the filing of this paper. However, the Examiner is authorized to charge any additional fees or credits as a result of the filing of this paper to Ford Global Technologies, Inc.'s Deposit Account No. 06-1510 as authorized by the original transmittal letter in this case. If a telephone or video conference would help expedite allowance or resolve any additional questions, such a conference is invited at the Examiner's convenience.

Respectfully submitted,

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